IT-Solutions for Animal Production

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Animal Production

Two years of experience with genomics - how well does it work ?

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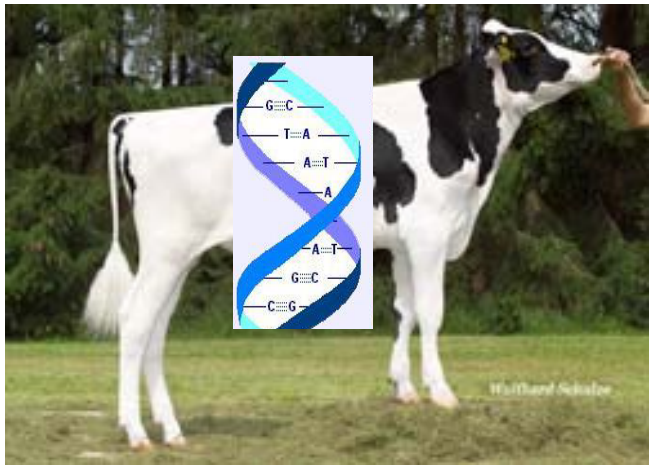
Introduction



Genomics:

- Completely new breeding technology

- High impact on breeding schemes
  - Organizations
  - Farmers

- Farmers have to believe
  - No historical experience i.e. ‘public’ validation
  - Animal proofs are not based on own/daughter performances
    - No ‘real’ individual measures
    - No animal with performance seen

- **➔ comprehensible validation essential**

Validation of genomics

GEBV test - November 2011

Official Results from the GEBV test (November 2011):

The following populations have succeeded to provide the information requested and passed the GEBV test (click in the links to download the respective GENO forms, which describe national genomic evaluation procedures):

Canada	Holstein	Canadian Dairy Network (CDN)	Aug 2010
Denmark, Finland, Sweden	Holstein	Nordic Genetic evaluation (NAV)	Aug 2010
France	Holstein	France Génétique Elevage	Aug 2010, Aug 2011
France	Montbéliard	France Génétique Elevage	Aug 2010
Germany	Holstein	Vereinigte Informationssysteme Tierhaltung w.V (vit)	Aug 2010, Jun 2011
Germany, Austria	Simmental	Bavarian State Research Center for Agriculture (LfL)	Jun 2011
Ireland	Holstein	Irish Cattle Breeding Federation	Aug 2011
Italy	Holstein	Associazione Nazionale Allevatori Frisona Italiana (ANAFI)	Jun 2011
Japan	Holstein	National Livestock Breeding Centre	August 2011
Poland	Holstein	Polish Federation of Cattle Breeders and Dairy Farmers	Aug 2010
New Zealand	Holstein, Jersey	Livestock Improvement Co. (LIC)	Aug 2010
Switzerland	Brown Swiss, Holstein, Red Holstein	Qualitas AG	Jun 2011
The Netherlands/Flanders	Holstein	Genetic Evaluation Sires (GES)	Aug 2010
United States	Holstein, Jersey	Animal Improvement Programs Laboratory (AIPL-USDA)	Aug 2010, Nov 2011
United States	Brown Swiss	Animal Improvement Programs Laboratory (AIPL-USDA)	Nov 2010, Nov 2011
Great Britain	Holstein	Scottish Agricultural College (SAC)	Nov 2011
Germany, Austria	Brown Swiss	Bavarian State Research Center for Agriculture (LfL)	Nov 2011
Italy	Simmental	Associazione Nazionale Allevatori Pezzata Rossa Italiana (ANAPRI)	Nov 2011

- **Method before introduction:**
  - Reduce reference population and verify on the excluded bulls
    - Difficult/un-reliable with small reference populations
  - National: for all traits ?
  - International (ICAR/Interbull): official only for production traits
    - Totally 21 country*breed genomic systems validated
      - 12 already since Aug. 2010 (thereof 8 HOL)

- **Method after official introduction:**
  - Compare earlier published ‘pure’ genomics with later published daughter based gEBV
  - **Advantage: reality**
  - Disadvantage:
    - needs time for late-occurring/low-heritable traits
    - Includes model changes

German Holstein genomics

- gEBV for Holsteins officially published since August 2010
  - EuroGenomics reference population >23,000 bulls (>6,500 with German daughters)

Rel. % young candidates	**sire-P.I.**	**gEBV**	**daughter equivalent**
Production	31%	**73%**	ca. 50 with 3 tests
Somatic Cell Score	31%	**76%**	ca. 85 with 3 tests
Conformation	28%	**57%**	ca. 25
Herd Life	26%	**52%**	ca. 100 1st +70 2nd La
Daughter Fertility	25%	**43%**	ca. 80 in 1st La
Calving Ease	33%	**53%**	ca. 40 calvings
Milking Speed	24%	**61%**	ca. 30
Total Merit RZG	29%	**65%**	

- Realistic reliabilities
  - No international harmonization how to calculate reliabilities for gEBV
  - National reliabilities for gEBV of young bulls not always correspond with quality of reference population

Validation of gEBV in practice

- 199 Holstein bulls with genomic proofs in 12-2010 (and first daughter proof in 04-2011)
- have in 04-2012 their 4th daughter proof i.e. with high reliability

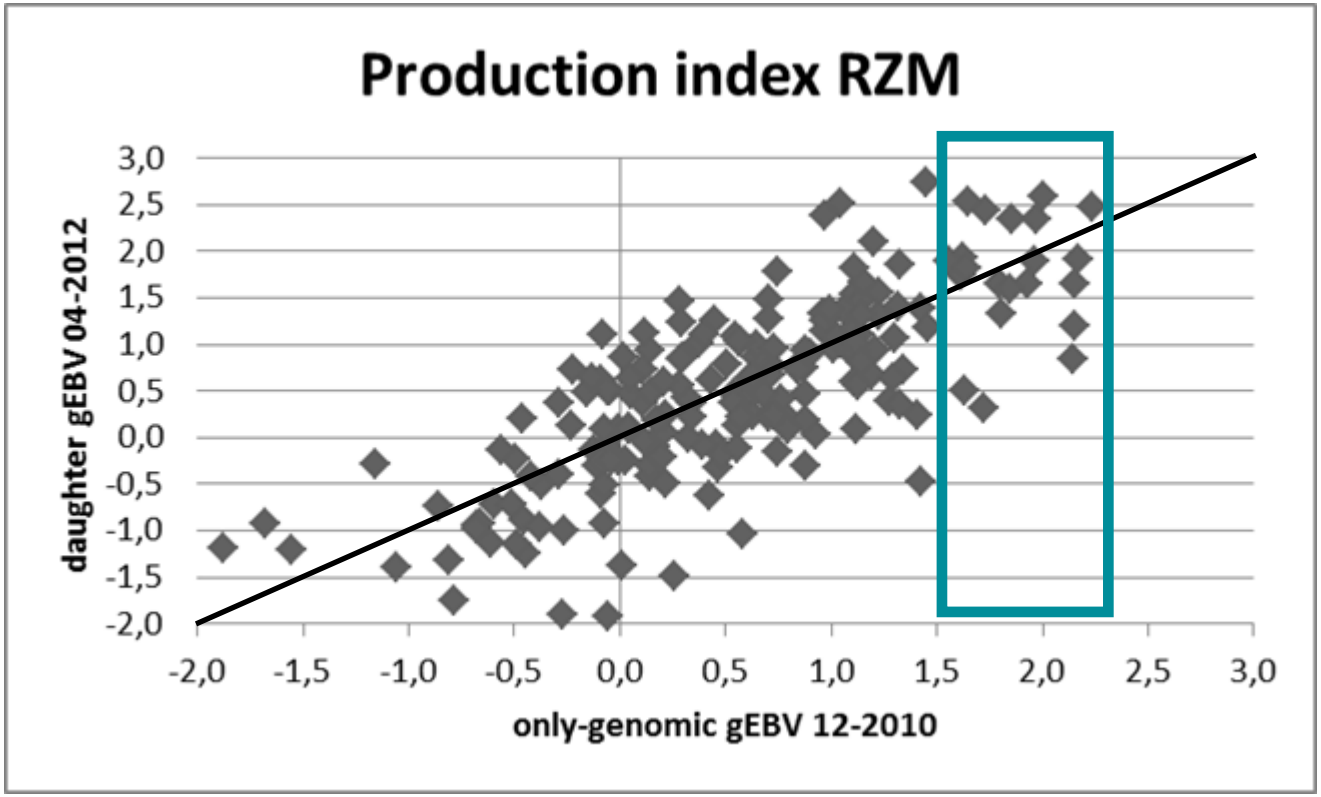
n=199	gEBV 1012*	gEBV 1204	Diff.
rel. (daug.) milk/SCS	*73.9% (0)*	*93.2% (114.3)*	
Prododuction index RZM	0.52	0.47	**-0.06**
RZS (SCS)	0.39	0.34	**-0.05**
Total conformation RZE	0.80	0.78	**-0.02**
Herd life RZN	0.79	0.71	**-0.07**
Daughter fertility RZR	0.18	0.10	**-0.09**
rel. total merit index RZG	*68.7%*	*83.0%*	
Total Merit RZG	1.04	0.91	**-0.13**

*) shift of base in 04-2011 corrected

Scale:
genetic standard deviations
Base 2012:
bulls born 2002-2004

- German HOL genomics approve with many daughters in average very good
  - Difference < 0.1 genetic standard deviation

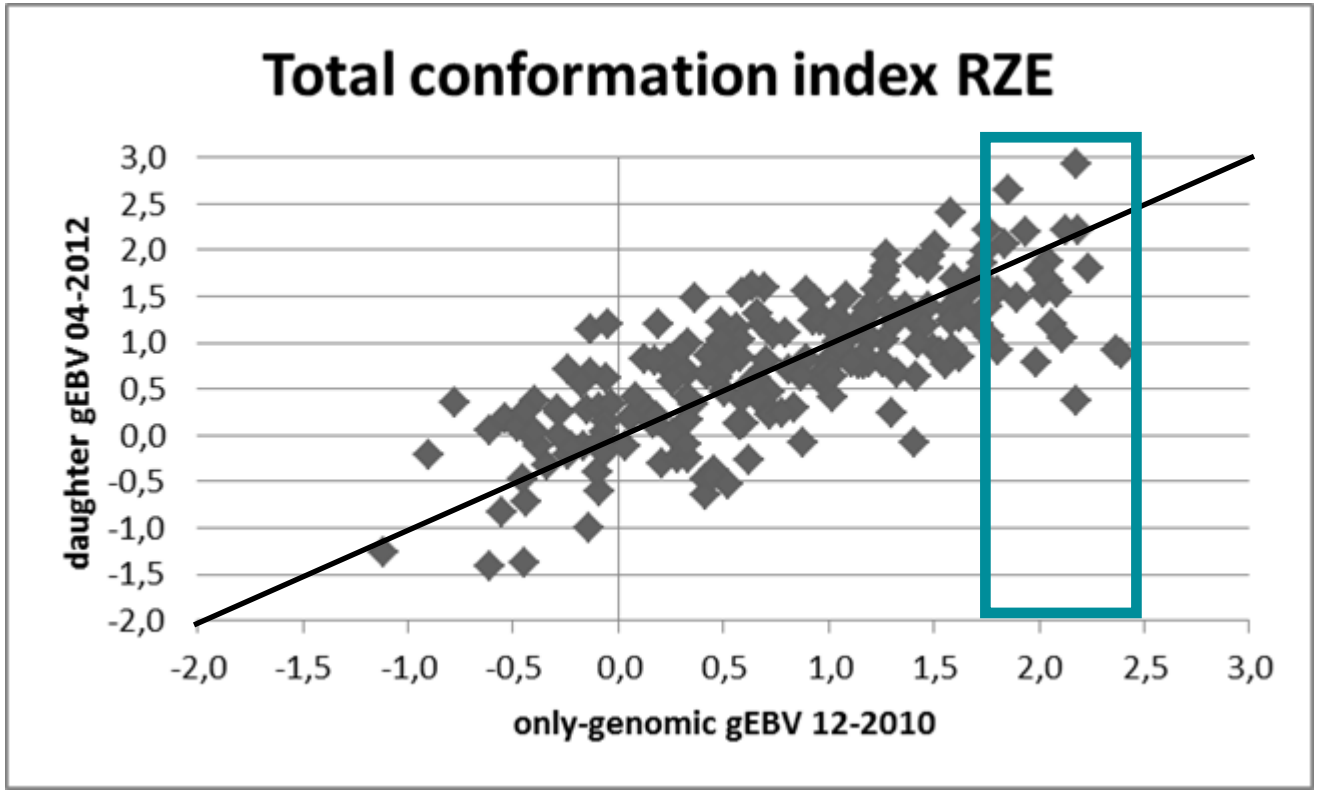
12-2010 genomic proofs ←→ 04-2012 daughter based proofs



Top 10%

- 04-2012: 4th daughter based poof incl. ∅ 114.3 daughters (∅ rel. 93.2%)
- Difference ∅ -0.06 s_g; deviation of individual bulls ∅ ± 0.63 s_g

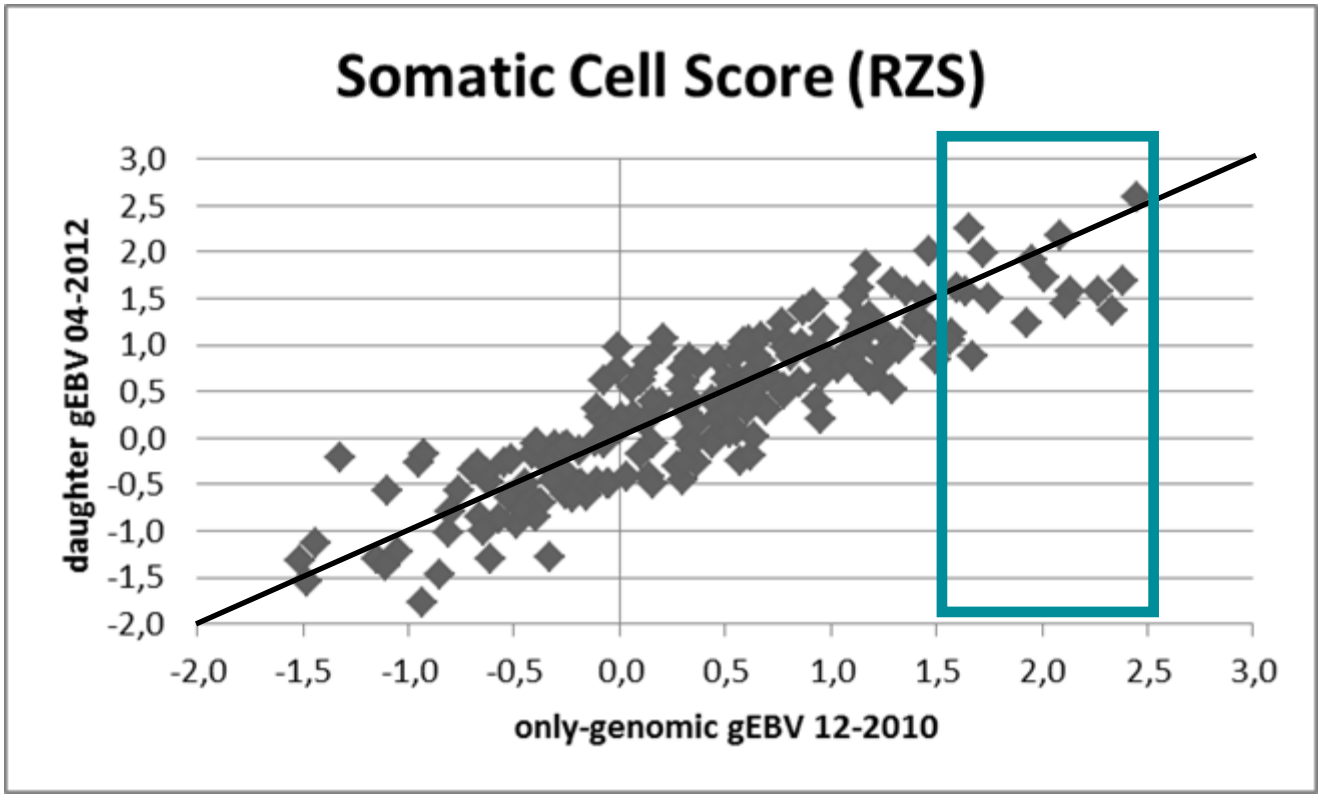
12-2010 genomic proofs ←→ 04-2012 daughter based proofs



Top 10%

- 04-2012: 4th daughter based poof incl. ∅ 59.6 daughters (∅ rel. 81.0%)
- Difference ∅ -0.02 s_g; deviation of individual bulls ∅ ± 0.57 s_g

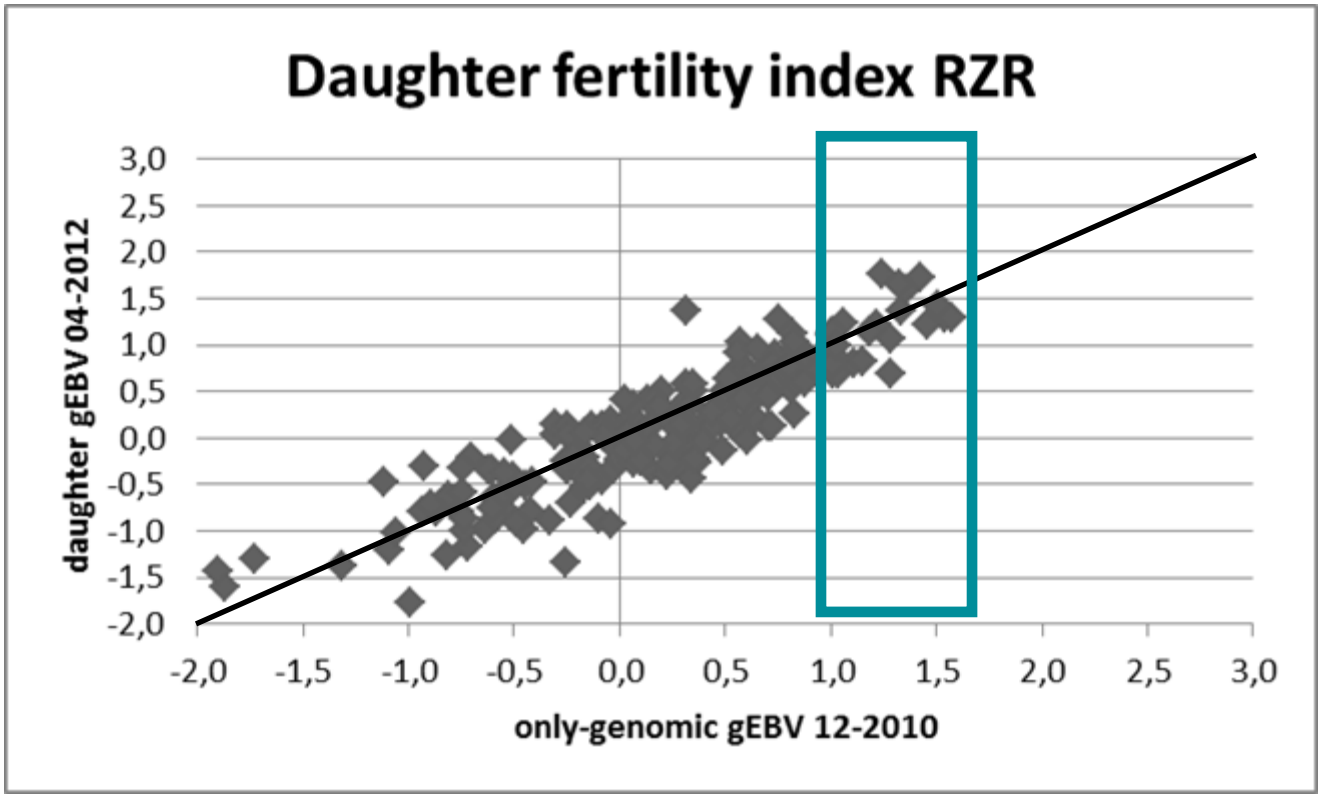
12-2010 genomic proofs ←→ 04-2012 daughter based proofs



Top 10%

- 04-2012: 4th daughter based poof incl. ∅ 114.3 daughters (∅ rel. 86.8%)
- Difference ∅ -0.05 s_g; deviation of individual bulls ∅ ± 0.42 s_g

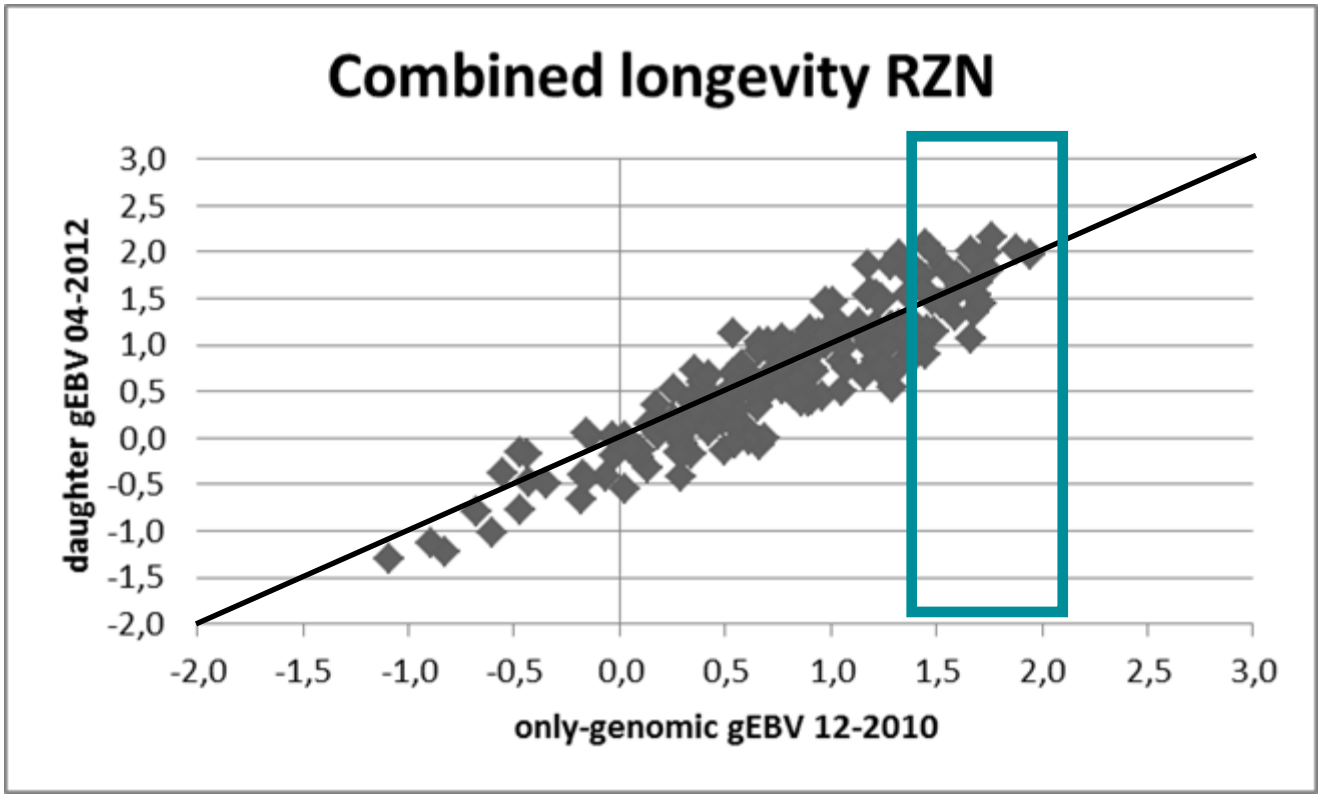
12-2010 genomic proofs ←→ 04-2012 daughter based proofs



Top 10%

- 04-2012: 4th daughter based poof , ∅ rel. 49.6%
- Difference ∅ -0.09 s_g; deviation of individual bulls ∅ ± 0.32 s_g

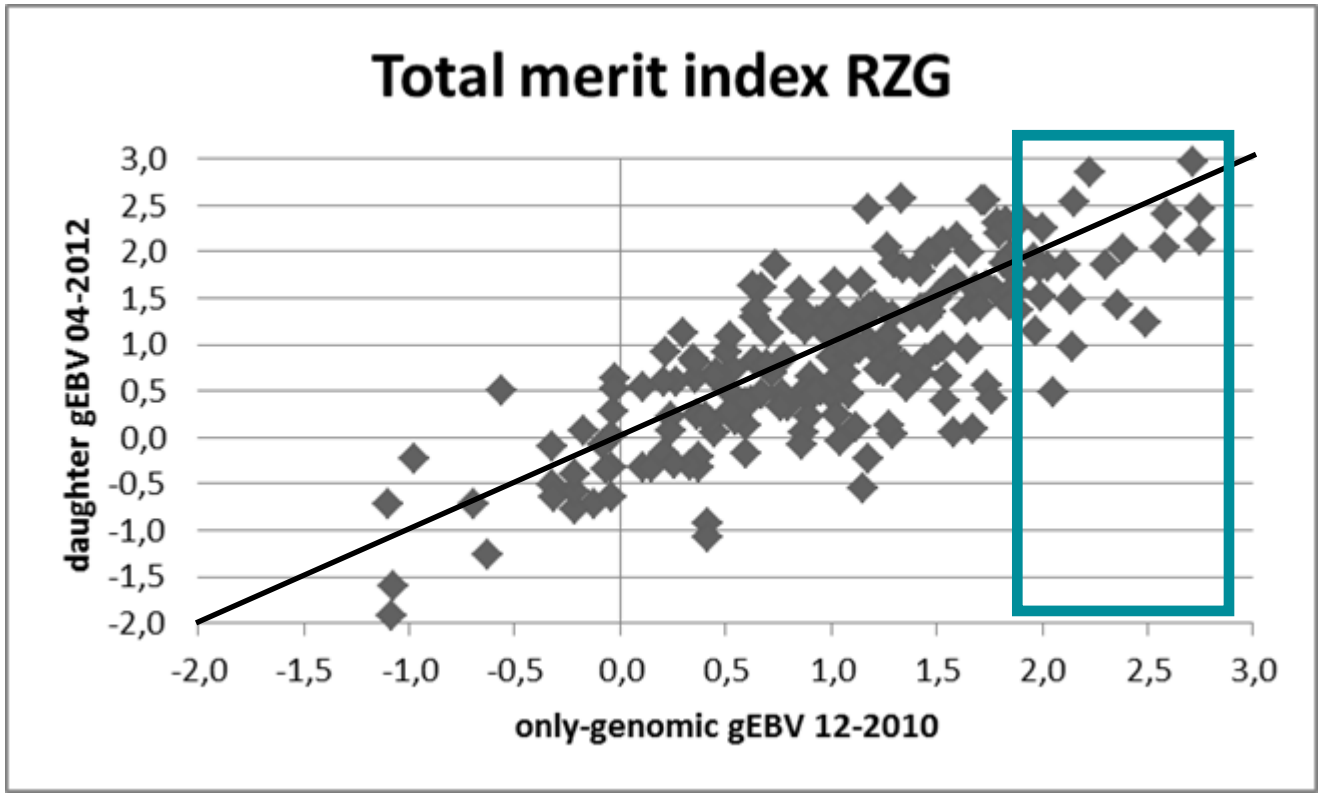
12-2010 genomic proofs ←→ 04-2012 daughter based proofs



Top 10%

- 04-2012: 4th daughter based poof, ∅ rel. 56.0%
- Difference ∅ -0.07 s_g; deviation of individual bulls ∅ ± 0.30 s_g

12-2010 genomic proofs ←→ 04-2012 daughter based proofs



Top 10%

- 04-2012: 4th daughter based poof, ∅ rel. 83.0%
- Difference ∅ -0.13 s_g; deviation of individual bulls ∅ ± 0.59 s_g

Validation of genomics in practice

- Validation of genomics in practice**:**
  - Is simple and comprehensible
    - Latest one year after official introduction
    - Should focus not only on average of all bulls, but on validation of top bulls
  - ➔ why not published in more countries ?

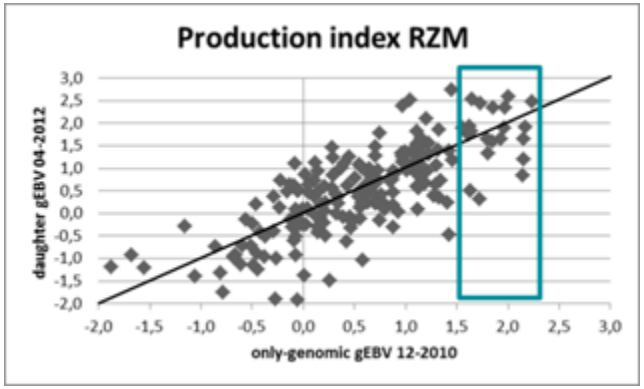
- Validation of German Holstein genomics in practice**:**
  - German gEBV of young Holstein bulls are realistic and unbiased
    - For all traits
    - For top genomic bulls

Guarini

(Goldwin x O-Man)

12-2010 = 0 daug.: RZG 143

04-2012 = 151 daug.: RZG 145



Conclusions

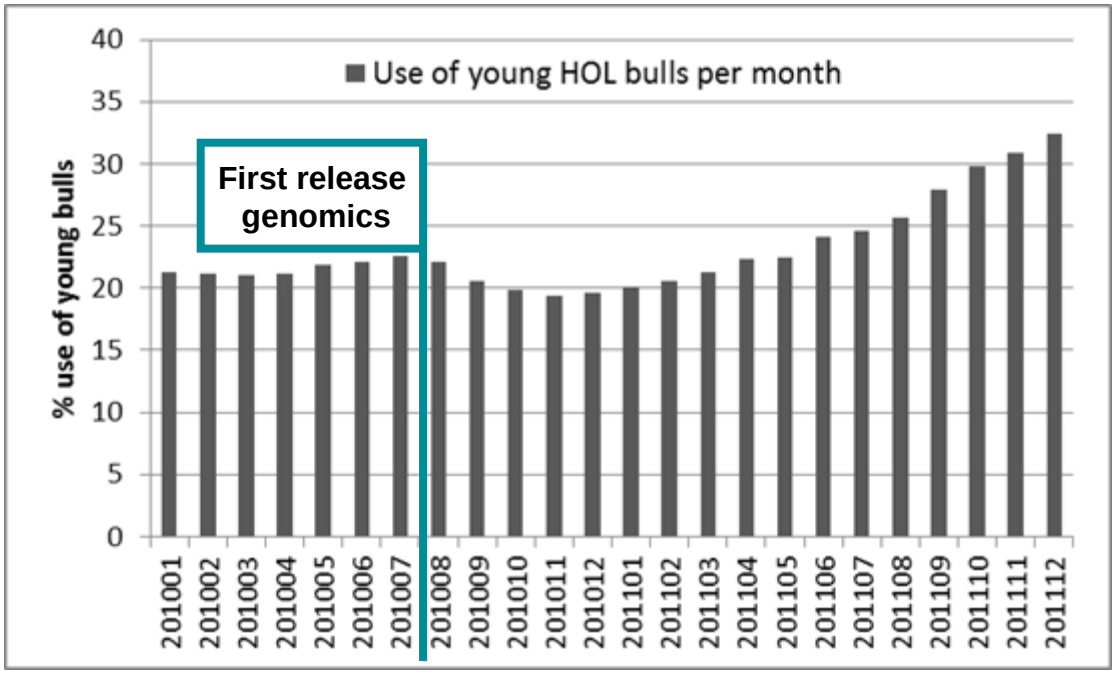
- German gEBV for young bulls are fully comparable to daughter proofs
- ➔ **selection can/should be done across young and daughter proven bulls**
- ➔ **young bulls should take big market share**
  - Because they offer much higher overall genetic level
    - Selected 1 out of 50-100 (10,000 bull calves tested per year in Germany)
    - instead of 1 out of 10-15 (1,000 bulls daughter proven per year in Germany)
  - Because they are more complete
    - less ‘compromises’ when A.I. studs buy a bull
    - especially for functional traits

Laron P
(Lawn Boy x Shottle)
born 2008
RZG 137
RZM 116 RZE127
RZS 116 RZN 128
RZR 112

Pioneer
(Planet x Shottle)
born 2009
RZG 143
RZM 120 RZE 127
RZS 119 RZN 134
RZR 111

Conclusions

- ➔ selection can/should be done across young and daughter proven bulls
- ➔ young bulls should take big market share
  - **The key is that farmers (can) believe in genomics !**
  - Validation of genomics in practice are therefore crucial



- In Germany significant increase of market share young bulls
- after validation in practice i.e. one year after first release

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2014

IDF/ISO Analytical Week and ICAR/INTERBULL Conference

Germany | Berlin

IDF/ISO 15–20 May
ICAR 19–23 May
Interbull 20–21 May

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